Magnetism instructions + answers

Compass use

Find a compass that works by first making sure there are no magnetic field sources (current carrying wires, steel, or bar magnets) within a couple feet of you. Then, slowly rotate the compass. If the needle does not rotate with the rest of the compass, your compass probably works.

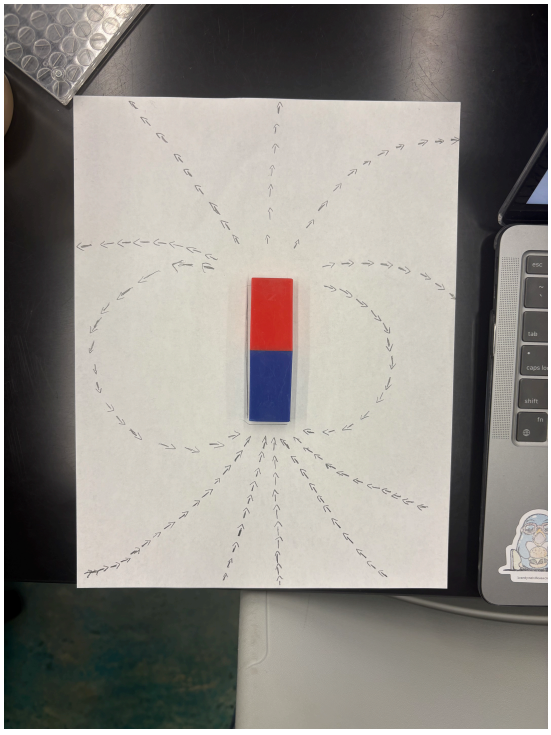
1. Use the north-south line given by the professor to find the north pointing end of the compass needle. If neither end of the needle points north, you need a different compass. What color is the north pointing end of the compass needle?

Bar magnet

2. Map the magnetic field of a bar magnet with the following procedure

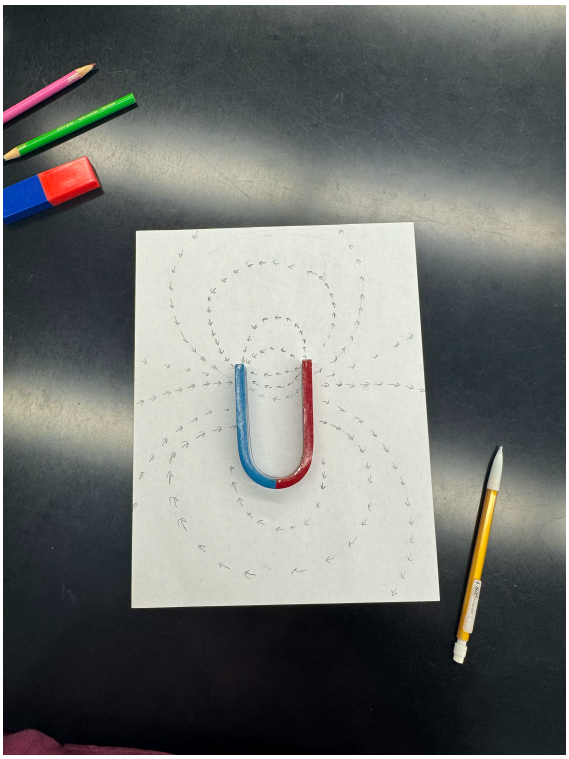
1. Place the magnet in the middle of the blank space below.
2. Trace the magnet
3. Place the compass near the magnet.
4. Mark the direction the compass needle points in.
5. Move the compass a short distance in the direction the needle points.
6. Repeat steps 4 and 5, then smoothly connect the markings you made.
7. You may use a magnetic field indicator to check that your lines are reasonable.

Draw 12 field lines for the bar magnet.



Horseshoe magnet

3. Draw 12 field lines for the horseshoe magnet, following the same steps as for the bar magnet. Make sure to use a small compass to map the field between the two ends of the magnet.



Coil

4. Place the coil vertically, connect it to a power supply, and set the power supply to 5V. Draw 12 field lines for the coil over the schematic on the following page. Follow the same steps as before. You may need to fold the paper so that you can hold it in the correct position.

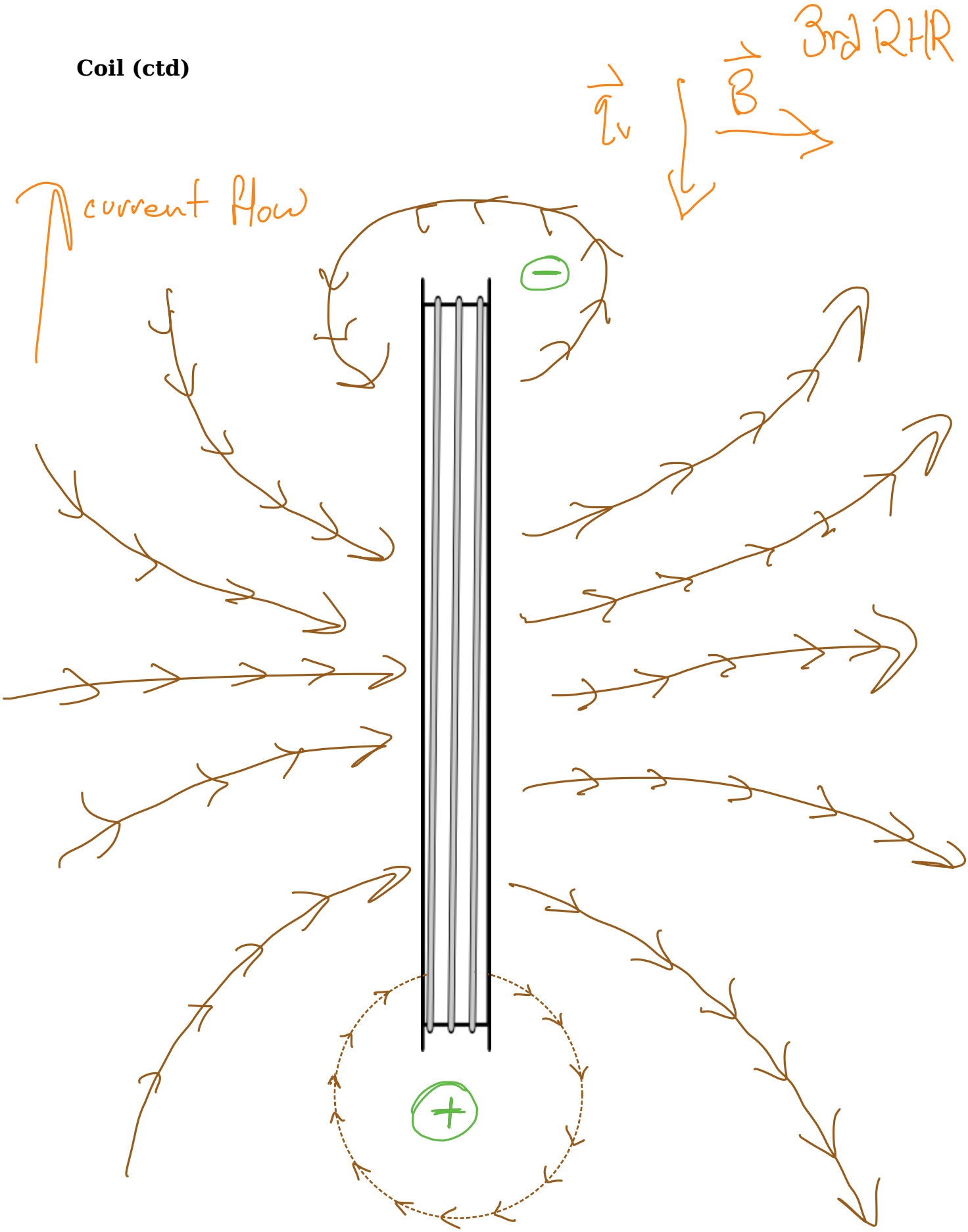
5. Add the direction of the current to the diagram you drew.

6. Next to the diagram, draw and label arrows representing your thumb and fingers if you were using the third right hand rule to predict the direction of the magnetic field at the center of the coil due to the coil's current.

7. Does your prediction match your findings?

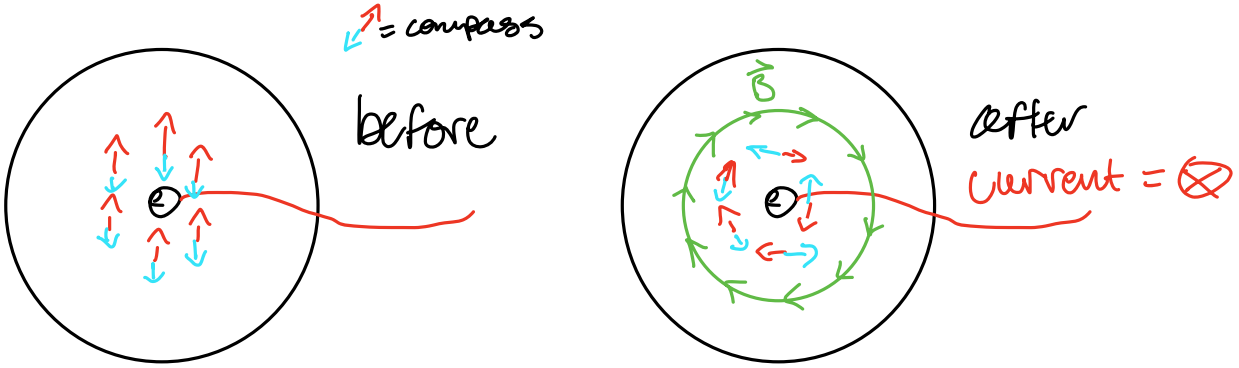
Yes, the compass matched our predictions

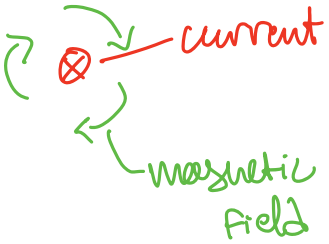
Coil (ctd)



Straight wire

8. Draw an above view of the wire and compasses before the current is switched on. Draw the same view after the current is switched on. On the second diagram, add a single field line for the magnetic field due just to the current.

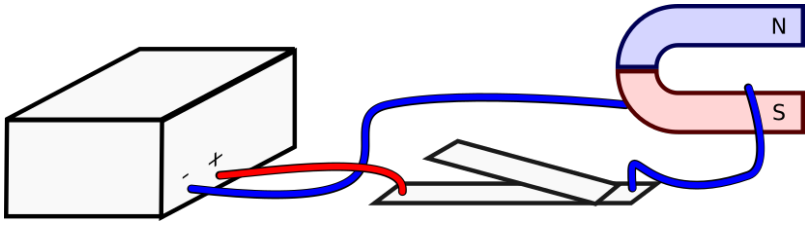




9. Add the direction of the current in the second diagram.

10. Draw and label arrows representing your thumb and fingers if you were using the second right hand rule to predict the direction of the magnetic field due to the current at the location of the compass.

Force on a wire



11. In the schematic above, what is the direction of the magnetic field the wire passes through?

N → S down

12. In the schematic above, what is the direction of the current when it is passing through the magnetic field?

into the page

13. Draw and label vectors representing your pointer, fingers, and thumb if you were using the first right hand rule to predict the direction of the force on the charges in the wire.

force ←

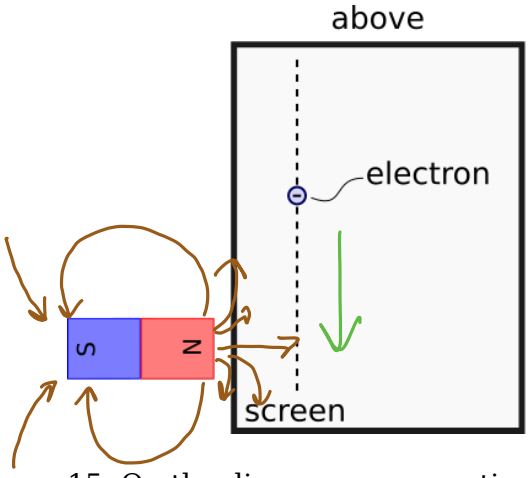
qv ↑

magnetic line (B) ↓

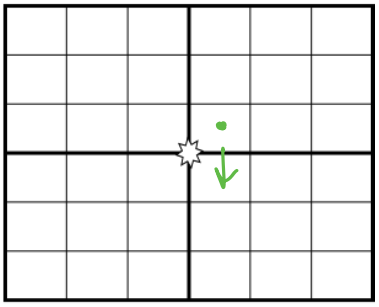
14. Actually run a current through the wire. Indicate on the diagram what direction you observe the wire to move in. Is it the same direction as the force you predicted above?

it goes into the diagram

Force on moving charge



qv ↑



into the page

15. On the diagram representing the view of the oscilloscope from above, draw and label vectors representing the magnetic field lines where the field is strongest, and **q v**.

16. Draw and label vectors representing your pointer, fingers, and thumb if you were using the first right hand rule to predict the direction of the force on the electrons. pointer = up (qv) thumb = in (F) middle = right (B)

17. Indicate on the schematic of the screen which direction the electrons will be deflected.

down

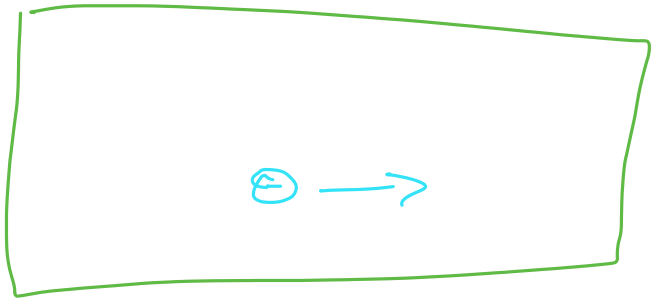
18. Conduct the experiment, by placing a magnet at the indicated location. Indicate which direction the electron beam is **actually** deflected.

down

19. Draw a schematic of the oscilloscope as viewed from above. Add the direction the magnetic field lines must be in for the electron beam to be deflected to the right.

If the beam is deflected to the right, the force is right, the magnetic field lines are out, and the qv is moving up

above



schematic